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Amendment to the Drawings

The attached replacement sheets 1 and 2 (of 5) include changes to drawings.

In Fig. 1A of replacement drawing sheet 1, a "prior art" label and reference number 125 identifying the LO signal has been added. In Fig. 1B of replacement drawing sheet 1, a "prior art" label has been added. In Fig. 2 of replacement drawing sheet 2, a "prior art" label has been added.

Replacement drawings are supplied herewith by facsimile, paper copies to follow by post.

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Remarks

I. Status of the Application

Claims 1-47 stand rejected as being indefinite under 35 USC § 112, 2nd paragraph.

Claims 1-47 stand rejected as being anticipated 35 USC § 103(a), as being obvious in view of USPN 5,852,662 to Forgues (herein "Forgues '662")

Responsive to the Examiner's arguments, the Applicant presents the following amendments to the application:

Specification paragraphs [0007], [0011], [0029], [0031], [0039] and [0043] are amended in accordance with the Examiner's instructions;

Originally filed claim 42 is hereby canceled without prejudice, the features of this claim being included in amended claim 41;

Claims 1, 9, 10, 18, 26-28, 40-41, 43-44 and 47 are presently amended;

Fig. 1A is amended to include missing reference indicia 125 and a "prior art" label. Figs. 1B and 2 are amended to include a "prior art" label. Replacement sheets are attached herewith. Paper copies of the Replacement drawings are being supplied by post.

Claims 1-41, and 43-47 remain pending in the application, the reconsideration of which is respectfully requested in view of the foregoing amendments and following remarks.

II. Amendments to the Claims

Claim 1 has been amended to remove the recitation of "further" per the Examiner's instructions to clarify that no previous term is recited.

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Claim 9 has been amended to correct a grammatical error.

Claim 10 has been amended to clarify that the mixer circuit is operable to maintain its coupling to the IF load during operation in the mixing mode and the bypass mode of operation. The deleted language equivalently recited this feature of the invention, albeit in terms of the state of the third and fourth switches. Applicant adopts the present formulation to more clearly recite the operation of the invention. Claims 26, 40 and 47 have been similarly amended.

Claim 18 have been amended to further clarify a feature of the invention in which switches 324 and 328 switch between outputs coupled to a common potential node, as shown in Fig. 3A.

Claim 27 has been amended to include the feature that the recited bypass and mixer cores are coupled to a common load, and that during both the mixing and bypass processes, the common load remains coupled to the mixer core. Support for this feature is provided in Fig. 4, and accompanying description in paragraph [0041]. Claim 41 has been similarly amended to recite these features in a multiple mixer system, the support for which is provided in Fig. 5B, as well as in paragraph [0044].

Claim 28 has been amended to remove features now incorporated into claim 27 from claim 28.

Claim 43 has been amended to depend from claim 41, as features within the previous base claim 42 have been incorporated into claim 41, and claim 42 canceled without prejudice.

Claim 44 has been amended to clarify the recited features pertaining to the operation of exemplary switches 324 and 328, and in particular the operations of coupling the outputs of each switch to either a common potential node, or opposite polarity nodes, as these conditions are described above. Fig. 3A shows an exemplary

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embodiment of when the outputs of first and second switches 324 and 328 are coupled to a common potential node (324b and 324c coupled to a common potential node 130a, 328b and 328c coupled to a common potential node 130b). When the state of the third and fourth switches 344 and 348 are reversed, the outputs of the first and second switches are coupled to opposite polarity nodes (324b coupled to 130a and 324c coupled to 130b, 328b coupled to 130a, and 328c coupled to 130b).

III. Rejections under 35 USC § 112, 2nd paragraph

Pending claims 1-41 and 43-47 stand rejected under 35 USC § 112, 2nd paragraph as being indefinite.

Claim 1 has been amended to remove the recitation of "further" per the Examiner's instructions. Accordingly, this ground for rejection is remedied.

The Applicant submits that the Examiner's suggested change in language regarding the recited switches would severely limit the claim scope entitled in the present invention. As noted in paragraph [0029], the term "switch" includes "transistors, diodes, and the like."

The Applicant believes that, in view of all of the embodiments included within the scope of the invention, the terms "input" and "output" are the most appropriate and descriptive terms for these features. Further, the terms "input" and "output" are used consistently throughout the application in reference to these features, such that no lack of clarity exists as to what feature is being referred to in the claims. Applicant asserts that the claimed scope for the recited terms "switch" and "switching means" includes all of those structures described in the present application and all of their equivalents without diminution, and the Examiner is invited to review the prior art to identify any possible equivalent to the term "switch" which could render anticipated or unpatentable this feature of the invention. Absent such a showing, the Applicant claims the full scope and equivalents of such features.

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Regarding the rejection of claim 18, Applicant submits that the recited phrasing "first [or second] switching means for coupling the first and second outputs of the first [or second] switch to either (i) a common node or (ii) opposite polarity nodes" complies with 35 USC § 112, 2nd paragraph in view of the disclosure of this feature in the application, and the recognized meaning of these terms in the art.

Regarding clarity of the term "common node" in claim 18, one skilled in the art would understand this term to refer to a connection point between two or more connections, the common node and the connection points operating at substantially the same potential. An exemplary embodiment of this condition is illustrated in Fig. 3A in which a common node is established between output 324b and 324c through switch 344 and extending to mixer output 130a, as the same potential is assumed along the entire commonly-connected line. Switch input 344a is coupled to output 344b, completing a common node path between 324b and 324c, and extending to output port 130b. Accordingly, first and second outputs 324b and 324c are coupled to a common node, as recited in claims 18, 26 and 44. Notwithstanding the forgoing, the Applicant wishes to remove any possible confusion as to the meaning of the term and accordingly amends the term to recite "common potential node" to clarify that the switch output ports are coupled to a common potential. As noted above, the Applicant provides the amendment in order solely to clarify the meaning of the term "common node," and does not by the present amendment relinquish any claim scope or equivalents originally entitled thereto.

In a similarly manner, the term "opposite polarity nodes" is understood by those skilled in the art to refer to two nodes having substantially oppositely-phased, equal magnitude potentials. Each of the input switches 324 and 328 operate in a condition, whereby the aforementioned outputs are connected not to the same potential, but to opposite potentials, these opposite potentials being supplied by means of a differential signal supplied to at input ports 110a and 110b, and when switch input 344a couples to output 344c, and switch input 348a couples to output 348b (opposite of the states

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shown in Fig. 3A). In such a state, switch output 324b is coupled to 130a, but switch output 324c is coupled to 130b. Similarly, switch output 328b is coupled to 130a, and switch output 328c is coupled to 130b. Lines 130a and 130b operate at substantially opposite polarities, as the differential signal provides one signal polarity to 130a via 110a and the opposite signal polarity to 130b via 110b. Accordingly in this manner, each of the first and second outputs 324b and 324c are coupled to oppositely polarized nodes, as recited in claims 18, 26 and 44.

It is to be noted that the invention is not limited to only processing of differential signals composed of oppositely-polarized signal components. As described in paragraph [0030], and expressly recited in claims 2, 33 and 46, the invention also pertains to the processing of a single-ended signal composed of, as known in the art, a signal level component and a signal ground component. The Applicant invites the Examiner to review the prior art for such references that he believes arguably anticipates or renders this aspect of the invention unpatentable. Absent such a showing, the Applicant claims the full scope and equivalents of such features.

IV. Rejections under 35 USC § 103(a)

Pending claims 1-41 and 43-47 stand rejected under 35 USC § 103(a) as being unpatentable in view of Forgues '662. The Applicant respectfully traverses the rejection based upon the following remarks.

The Present Invention

The invention employs an arrangement of four switches which provide a selectable bypass and mixing mode of operation which is not shown or suggested, either individually or collectively, in the cited references.

As recited in claims 1 and 31, and including reference numbers of the exemplary embodiment shown Fig. 3A for ease of identifying said exemplary features, the recited mixer circuit 300 includes:

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a mixer core (320), comprising:

a first switch (324) having an input (324a) switchable between a first output (324b) and a second output (324c); and

a second switch (328) having an input (328a) switchable between a first output (328b) and a second output (328c); and

a mode select circuit (340) coupled to the mixer core (320), the mode select circuit comprising:

a third switch (344) having an input (344a) coupled to second output (324c) of the first switch (324), the input (344a) switchable between a first output (344b) coupled to the first output (324b) of the first switch (324), and a second output (344c) coupled to the second output (328c) of the second switch (328); and

a fourth switch (348) having an input (348a) coupled to the first output (328b) of the second switch (328), the input (348a) switchable between a first output (348b) coupled to the first output (324b) of the first switch (324), and a second output (348c) coupled to the second output (328c) of the second switch (328).

The states of the third and fourth switches determine in which of the modes, bypass or mixing, the mixer circuit operates. The bypass mode is illustrated in Fig. 3A, in which each of the inputs 110a and 110b is switched between outputs of the substantially the same potential. In such a state, the first switch 324 switches between outputs of substantially the same potential, and accordingly a signal supplied to the input terminal 324a of the first switch 324 is transferred to the first IF at 130a. Similarly, the second switch 328 switches between outputs of substantially the same potential, and a signal supplied to the input terminal 328a of the first switch 328 is transferred to the first IF at 130b. In this manner, a signal bypass effect is achieved.

The mixing mode of the circuit is implemented by reversing the output states of the third and fourth switches. In particular, the third switch input 344a is coupled to its second output 344c, and the fourth switch input 348a is coupled to its first output 348b. In such an instance, the first switch 324 switches between its first output 324b, which is

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coupled to the first IF port 130a, and its second output 324c, which is coupled to the second IF port 130b. The second switch 328 operates in a complementary manner, switching between its second output 328c coupled to the second IF port 130b, and its first output 328b coupled to the first IF port 130a. In this manner, input signals from both inputs 110a and 110b are supplied to each of the IF ports 130a and 130b, and a mixing effect is produced. In a particular embodiment of the invention, the signal inputs 110a and 110b are differential signals. In another embodiment of the invention, the signal inputs 110a and 110b are in single-ended format in which one of the inputs 110a or 110b is fixed at signal ground potential, and the other input voltage varies higher or lower than the signal ground.

Claims 18 and 44 recite further embodiments of the mixer circuit and method or operation operable with a differential input signal. In these embodiments, the switching of the third and fourth switches are operable to provide to the outputs of respective first or second switches, either a common potential node, or oppositely polarized nodes, thereby providing either bypass or mixing functionality, as described above.

Additionally novel features of the invention are further recited in claims 10, 26, 27, 40, and 41, whereby a load coupled to mixer core remains coupled thereto during the mixer's operation in both the bypass mode and mixing mode.

Forgues '662 Distinguished

While Forgues '662 pursues the same objective of the present invention, that being providing a mixing circuit operable in a bypass or mixer mode (the referred to scrambler circuit 40 described in Fig. 2 of Forgues '662), the approach taken to provide such functionality is quite different from the present invention. In particular, while the present invention describes an approach by which the output ports of switches 324 and 328 are connected to either a common potential or to opposite potentials to provide bypass or mixing functionality, respectively, Forgues '662 teaches a signal routing approach, whereby an input signal is either fed into a mixer, or bypassed around it.

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There is no teaching or suggestion of the switch architecture presently described and recited, or connecting the output ports of any such input switches to either a common potential or opposite potentials to provide a bypass or mixing function.

No Teaching in the Art of the Recited First and Second Switches

In comparing Forgues '662 to the present invention, the only apparent features which Applicant assesses as being arguably equivalent to those in the present application are switches 52 and 56, respectively, as these appear to be related to the control of the mixer and bypass modes of operation, which could be argued similar to Applicants third and fourth switches.

However, Forgues '662 does not show or suggest equivalents to Applicant's first or second switches, nor how its switch 52 is connected to the first and second switches equivalents as recited in claim 1,

"(the) third switch having an input coupled to second output of the first switch, the input switchable between a first output coupled to the first output of the first switch, and a second output coupled to the second output of the second switch."

Similar deficiencies exist as to switch 56 in Forgues in relation to Applicant's recited fourth switch.

With regards to claims 18 and 44, as Forgues '662 does not teach equivalents to Applicant's first and second switches, the reference is consequently silent as to coupling the outputs of each of the first and second switches to either (i) nodes of a common potential for a signal bypass operation, or (ii) node of opposite polarities for a mixing operation.

Accordingly, as the aforementioned features are not shown or suggested, either individually or collectively, in the cited references, independent claims 1, 18, 31 and 44

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are patentable thereover. As these claims serve as the base claims for 2-26, 32-40 and 45-47, these dependent claims are allowable for at least the same reasons.

Further deficiencies of the cited art with respect to Applicant's first and second switches include:

A feature of claim 2: "the first and second switches are configured to receive oppositely polarized signals comprising a differential signal." This feature of the invention is also included in claims 31, 34 and 45;

A feature of claim 4: "the first and second switches are configured to switch their respective inputs between their two outputs at a second frequency." This feature is also included in claims 9, 21, 25, 34, 35 and 39; and

A feature of claim 10: "the input of each of the first and second switches are operable to continue switching between their respective first and second outputs at the predefined frequency . . . during mixer operation in both the mixing mode and the bypass mode." This feature is also included in claims 26, 40 and 47.

Accordingly, the claims as well as their dependents are further allowable over the cited art for these additional reasons.

No Teaching in the Art of Maintaining Coupling between the Mixer Core and the Load During Bypass and Mixing Modes.

Independent claim 27 has been amended to recite:

"a mixer core having . . . a load port coupled to the common load;
wherein, during both the mixing and bypass modes of operation, the
common load remains coupled to load port of the mixer core."

An exemplary embodiment of this arrangement is shown in Fig. 4, and described in the accompanying text in paragraph [0041]. Independent claim 41 recites a system

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employing multiple mixers of this recited configuration, as shown and described in Fig. 5B and paragraph [0044].

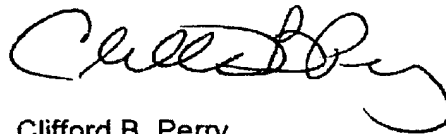
In contrast to a mixer-load arrangement which remains coupled during both the mixing and bypass operations, Forgues '662 teaches a switch between the mixer and the load that interrupts the connection therebetween when a bypass mode is selected. Reference is made to Fig. 2 of Forgues '662 in which it is shown that switch 56 located between the mixer 44 and the load (beyond 58) is opened when a bypass mode is selected, and closed during mixing operations.

Accordingly, the cited art does not show or suggest a mixer-load arrangement which remains coupled during both bypass and mixing modes of operation, claims 27 and 41 reciting said feature is allowable thereover. Furthermore dependent claims 28-30 and 43 are allowable for at least the same reasons.

Conclusion

The Applicant submits that the pending claims 1-41 and 43-47 are patentable over the prior art, and accordingly requests the issuance of a Notice of Allowance. Should the Examiner believe an interview would expedite prosecution of the case, a telephone call or e-mail to the Applicants' representative is invited.

Respectfully submitted,



Clifford B. Perry
Attorney for Applicants
Reg. No. 43,854

132 N. El Camino Real, # 347
Encinitas, CA 92024
Tel: (858) 345-5520
Fax: (866) 233-8890
cperry@perryiplaw.com